

Claims

1. A fuel injector comprising:
an injector body with a metallic tip having
5 an outer surface; and
a non-metallic insulator attached to said
tip and covering a portion of said outer surface.

2. The fuel injector of claim 1 wherein
10 said metallic tip includes a valve seat and a
centerline;
said tip defines a plurality of nozzle
outlets; and
said insulator covers said outer surface
15 only above a plane that is perpendicular to said
centerline and positioned between said nozzle outlets
and said valve seat.

3. The fuel injector of claim 1 wherein
20 said non-metallic insulator includes a ceramic
material.

4. The fuel injector of claim 3 wherein
said non-metallic insulator is ceramic.
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5. The fuel injector of claim 4 wherein
said non-metallic insulator is less than about 3
millimeters thick.

6. The fuel injector of claim 5 wherein
30 said insulator is sufficiently resistant to heat
transfer such that the temperature of said valve seat

does not reach a tempering temperature during engine compression release braking.

7. The fuel injector of claim 1 wherein
5 said tip includes said valve seat and said centerline;
said tip defines a plurality of nozzle
outlets;

said insulator covers said outer surface
only above a plane that is perpendicular to said
10 centerline and positioned between said nozzle outlets
and said valve seat;

said insulator includes a ceramic material;
and

said insulator is sufficiently resistant to
15 heat transfer such that the temperature of said valve
seat does not reach said tempering temperature during
engine compression release braking.

8. The fuel injector of claim 1 wherein
20 said insulator is sufficiently resistant to heat
transfer such that the temperature of the valve seat
does not reach said tempering temperature during
simultaneous engine compression release braking and
exhaust braking.

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9. A method of reducing injector tip
overheating comprising the steps of:

providing a fuel injector with a metallic
tip having an outer surface; and

30 attaching a non-metallic insulator to said
tip and covering a portion of said outer surface.

10. The method of claim 9 wherein said tip includes a valve seat and a centerline;

said tip defines a plurality of nozzle outlets; and

5 said attaching step includes a step of attaching said insulator to said outer surface only above a plane perpendicular to said centerline, positioned between said valve seat and said nozzle outlets.

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11. The method of claim 9 including a step of choosing an insulating material; and

sizing and attaching said insulating material such that the temperature of said valve seat
15 does not reach a tempering temperature during exhaust braking.

12. An engine comprising:

an engine housing with a plurality of fuel
20 injectors attached;

each of said fuel injectors having a metallic tip with an outer surface;

a non-metallic insulator attached to said tip and covering a portion of said outer surface;

25 each of said injectors positioned at least partially within an engine cylinder; and

said engine includes at least one engine compression release brake.

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13. The engine of claim 12 wherein:

each injector has a metallic tip with a valve seat and a centerline;

said tip defines a plurality of nozzle outlets;

said insulator covers said outer surface only above a plane that is perpendicular to said centerline and positioned between said nozzle outlets and said valve seat.

10 14. The engine of claim 12 wherein said non-metallic insulator includes a ceramic material.

15 15. The engine of claim 14 wherein said non-metallic insulator is ceramic.

16. The engine of claim 15 wherein said non-metallic insulator is less than about 3 millimeters thick.

17. The engine of claim 16 wherein said insulator is sufficiently resistant to heat transfer such that the temperature of said valve seat does not reach a tempering temperature during engine compression release braking.

18. The engine of claim 17 wherein said insulator is sufficiently resistant to heat transfer such that the temperature of said valve seat does not reach a tempering temperature during simultaneous engine compression release braking and exhaust braking.

19. The engine of claim 12 wherein said tip includes said valve seat and said centerline;

said tip defines a plurality of nozzle outlets;

said insulator covers said outer surface only above a plane that is perpendicular to said centerline and positioned between said nozzle outlets and said valve seat;

said insulator includes a ceramic material; and

said insulator is sufficiently resistant to heat transfer such that the temperature of said valve seat does not reach said tempering temperature during engine compression release braking.

20. The engine of claim 19 wherein said insulator is sufficiently resistant to heat transfer such that the temperature of said valve seat does not reach said tempering temperature during simultaneous engine compression release braking and exhaust braking.